Monitoring and Assessing the Restoration and Protection of Barnegat Bay: *Quo vadimus?*

L. Stanton Hales, Jr., Martha Maxwell-Doyle, and James Vasslides

Barnegat Bay Partnership

BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

National Estuary Program

CWA § 320 established by Congress in 1987 to protect estuaries of "national significance"

National Estuary Program

- **Section 320 of the Clean Water Act established the National Estuary Program in 1987; directs USEPA to convene a "Management Conference" to develop plans (CCMP) for attaining and maintaining water quality in an estuary.**

- **CCMP includes protection of public water supplies; the protection and propagation of native populations of shellfishes, fishes, and wildlife; CCMP allows recreational and other activities; requires control of point and nonpoint sources of pollution.**

- **Authorized NOAA to carry out comprehensive water quality sampling program, baseline studies, trend assessment, predictive modeling, ….**

BBP Priorities

- Reduce eutrophication & improve water quality.
- Address water supply & flow issues.
- Prevent habitat loss & support habitat restoration.
- Protect and restore fish and wildlife.
- Address land use.

Monitoring & Research

Topic: funded studies

Nutrients/water quality-14

Monitoring-1

Soil processes-5

Land use/habitat-5

Economics-2

Climate change-1

SAV/Wetlands/Algae-7

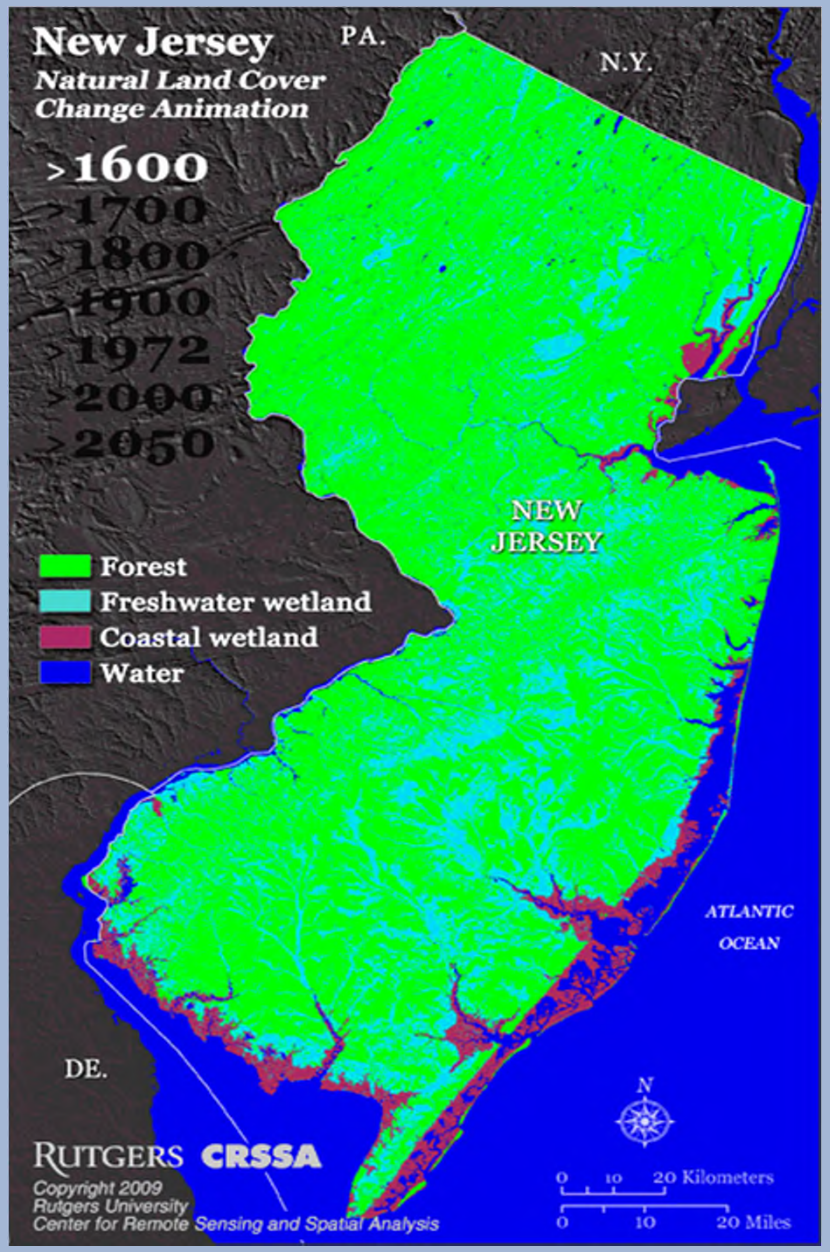
Fishes/crabs-5

Jellyfishes-5

Governor's 10-Point Plan for the Barnegat Bay

- **Closing OCNGS in 10 yrs**
- **Stormwater Mitigation ($10 million x 10 yrs)**
- **Fertilizer Regulation**
- **Soil Health Restoration Regulation**
- **Land Acquisition**
- **Special Area Management Plan (SAMP)**
- **Rigorous Water Quality Standards (TMDL)**
- **Education**
- **Comprehensive Research**
- **Reducing Water Craft Impacts**

How is the New Jersey Changing?


New Jersey
Natural Land Cover
Change Animation
>1600
>1700
>1800
>1900
>1972
>2000
>2050
PA.
N.Y.
NEW
JERSEY
Forest
Freshwater wetland
Coastal wetland
Water
ATLANTIC
OCEAN
DE.
N
0 10 20 Kilometers
0 10 20 Miles
RUTGERS CRSSA
Copyright 2009
Rutgers University
Center for Remote Sensing and Spatial Analysis

MACWA

Mid-Atlantic Coastal Wetlands Assessment

- **Establish an integrated wetlands monitoring and assessment program in the Delaware Bay and Barnegat Bay Estuaries and beyond.**

PARTNERSHIP FOR THE DELAWARE ESTUARY INC.

BARNEGAT BAY PARTNERSHIP

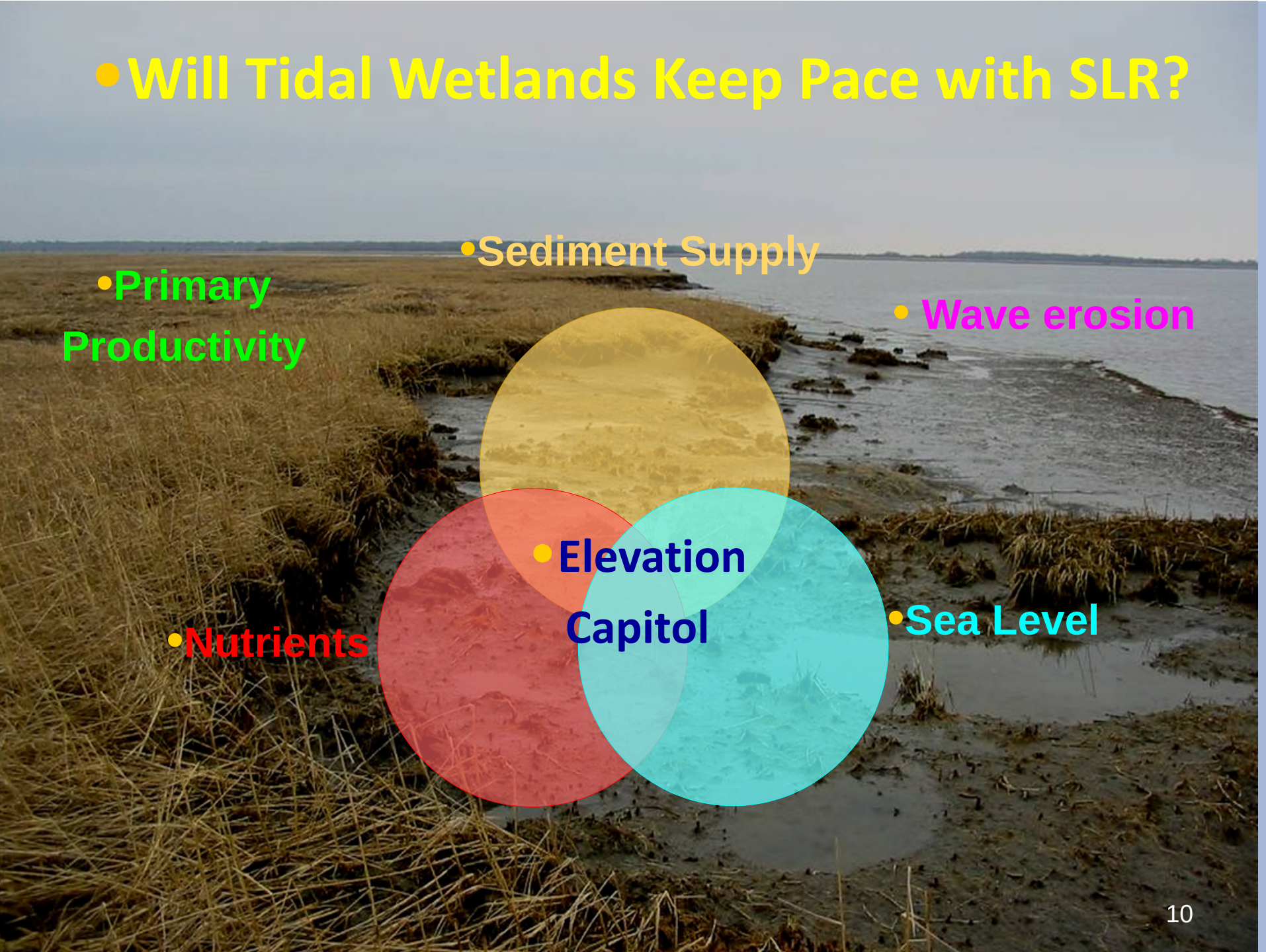
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

THE ACADEMY OF NATURAL SCIENCES

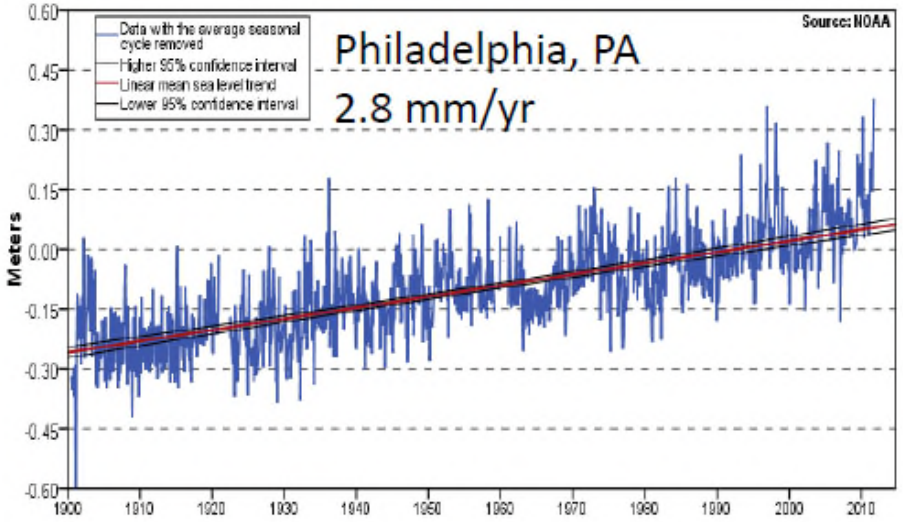
NJ COASTAL MANAGEMENT PROGRAM

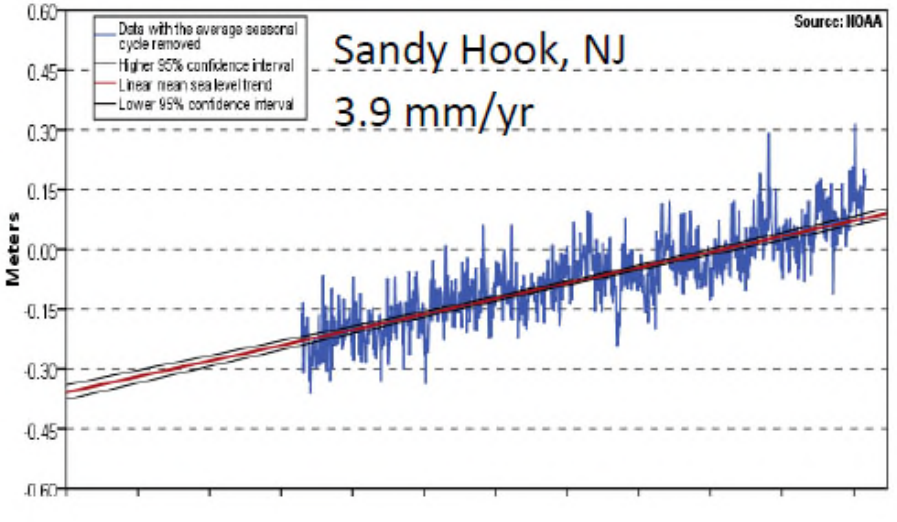
U.S. FISH & WILDLIFE SERVICE

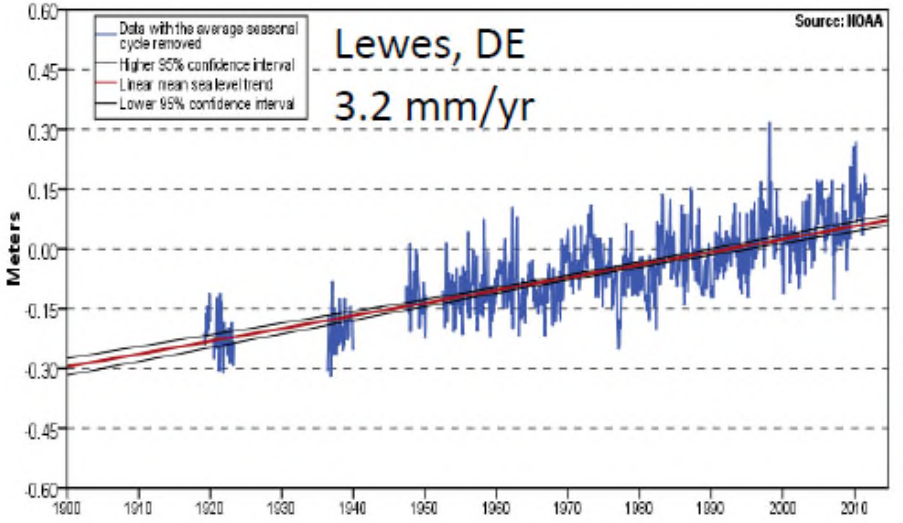
Will Tidal Wetlands Keep Pace with SLR?

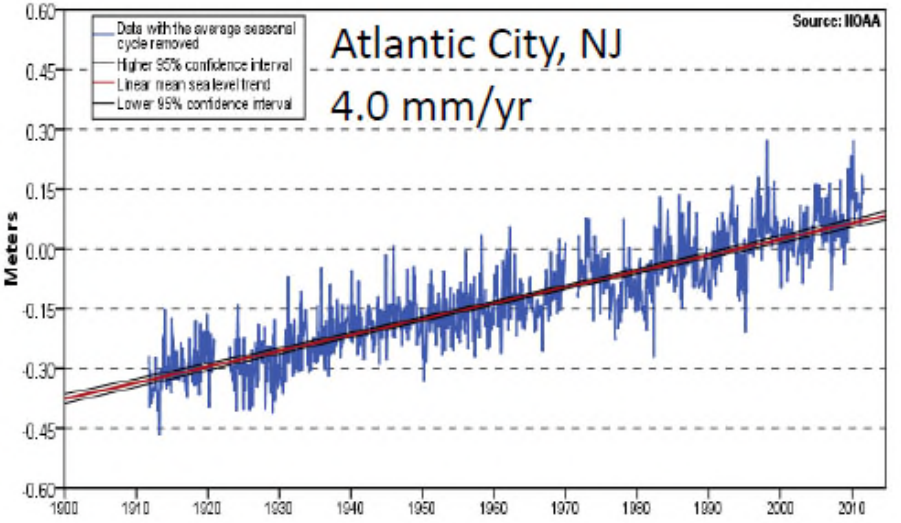


Tide gauges show a regional increase in relative sea level









BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

Wetland Trends

- 45% of BB is bulkheaded
- Between 1995-2007 average shoreline loss (retreat) baywide was 54 ft (4ft/yr)
- Sediment limited; not keeping up with SLR
- High conversion of wetlands to mudflats
- Impact of Open Water Marsh Management

Climate-ready estuary?

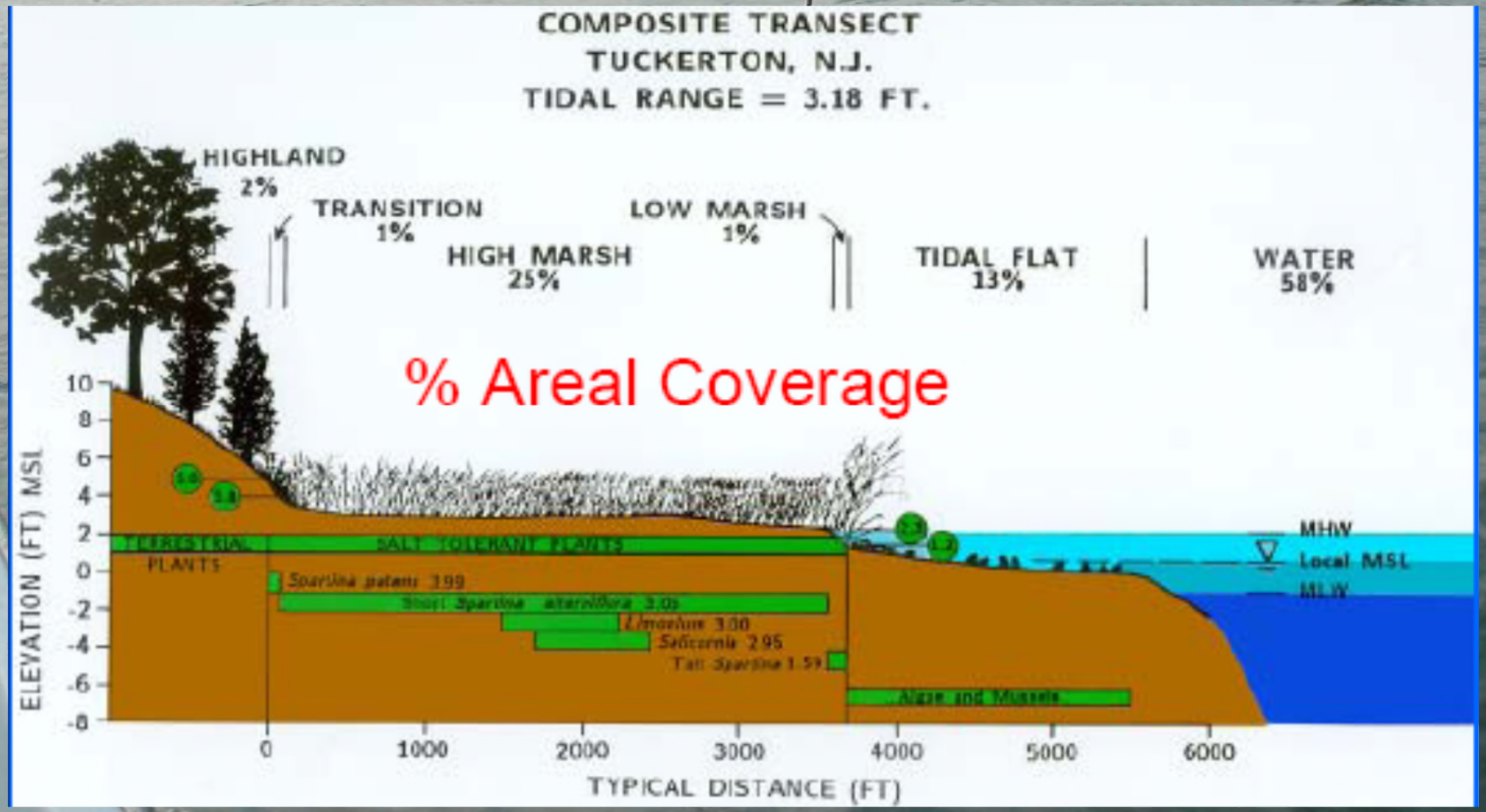


Figure from Kana et al., 1988

Photo courtesy of Rutgers University

Climate-ready estuary?

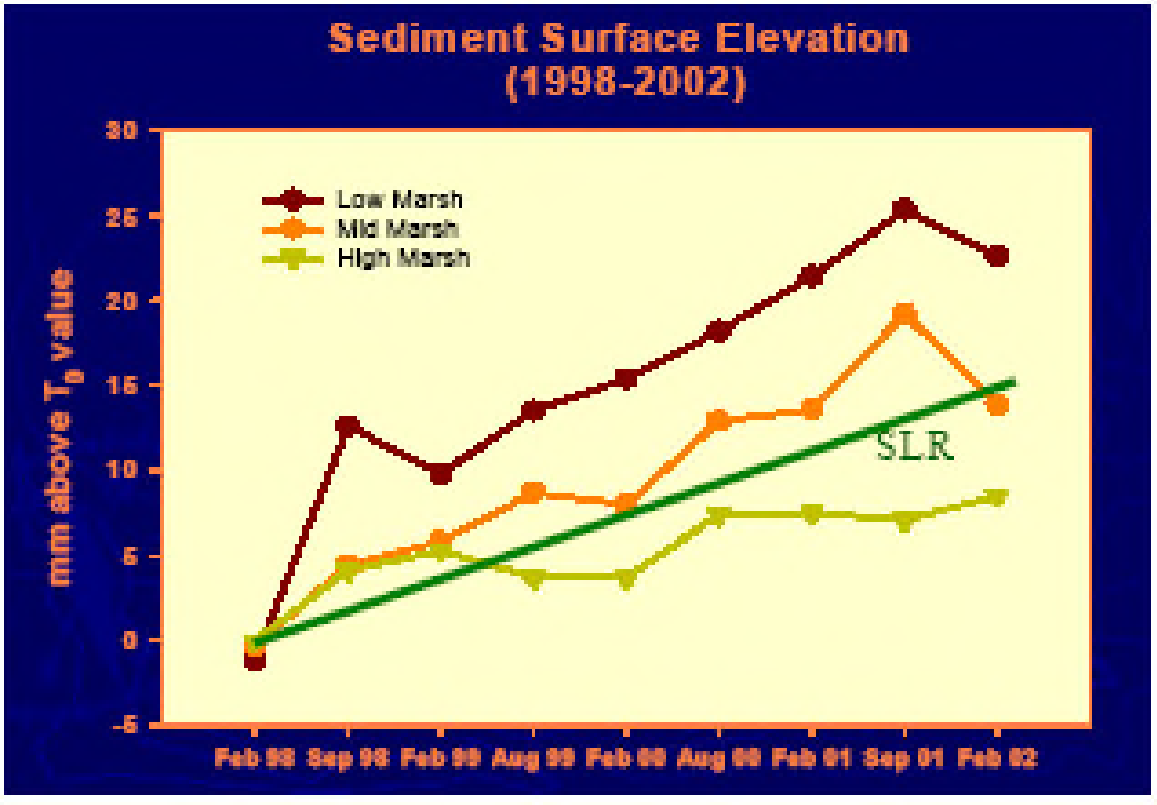


Figure courtesy of UVA LTER

Photo courtesy of Don Cahoon


Barnegat Bay
Partnership
RESEARCH · EDUCATE · RESTORE


Barnegat Bay
Partnership
RESEARCH · EDUCATE · RESTORE

Post-Sandy Questions

How important are coastal wetlands for resilience?

How are wetlands responding to sea level rise, storms? Where will wetlands likely survive in the future?

How do other stressors (e.g. pollution, management practices) affect wetlands and their resilience properties?

Can declines in coastal wetland condition, ecosystem services and resilience be reversed, and if so what is the ROI (costs & benefits)?

Can we provide site-specific guidance on BMPs and actions to promote the greatest coastal resilience via healthy wetland acreage?

Monitoring Objectives

Site Specific Intensive Monitoring

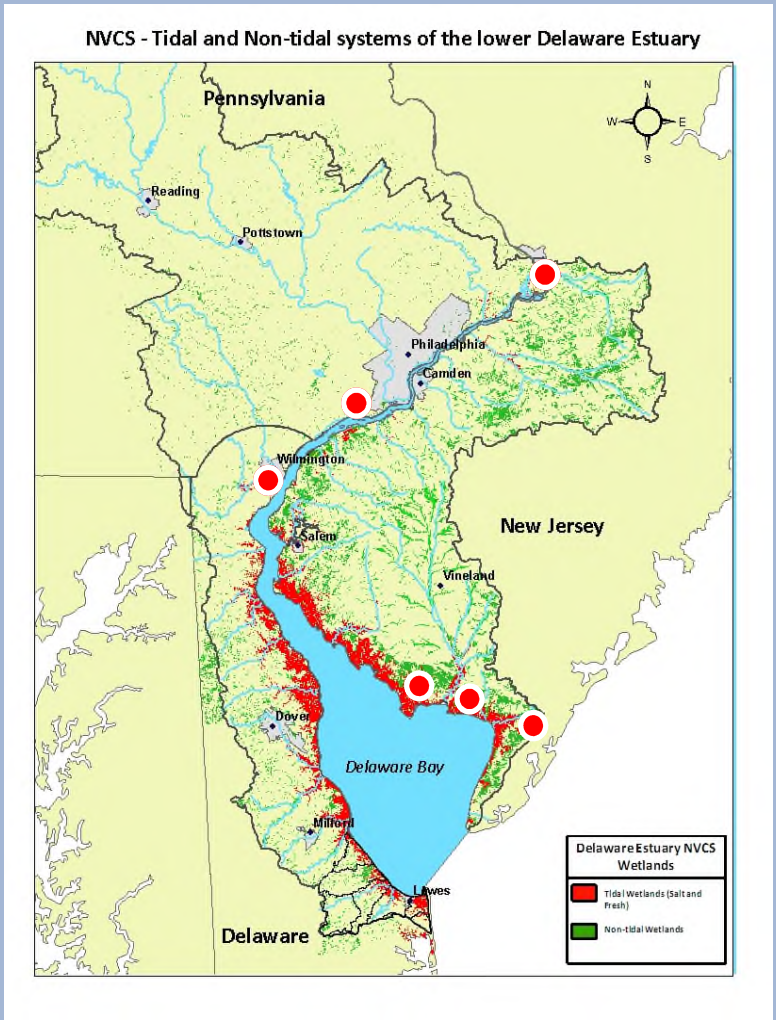
- **Surface elevation (SETs, MHs, and barcode level)**
- **Plant zones, cover, ht over time (LT, elevations, quads)**
- **Plant biomass (above-below biomass)**
- **Algal biomass (soil surface chl a)**
- **Soil chemistry (soil cores – C, N, and P)**
- **Water quality (YSI spot measurements, creek water collection – NO3, NH4, ALK, TSS)**
- **Faunal Integrity**

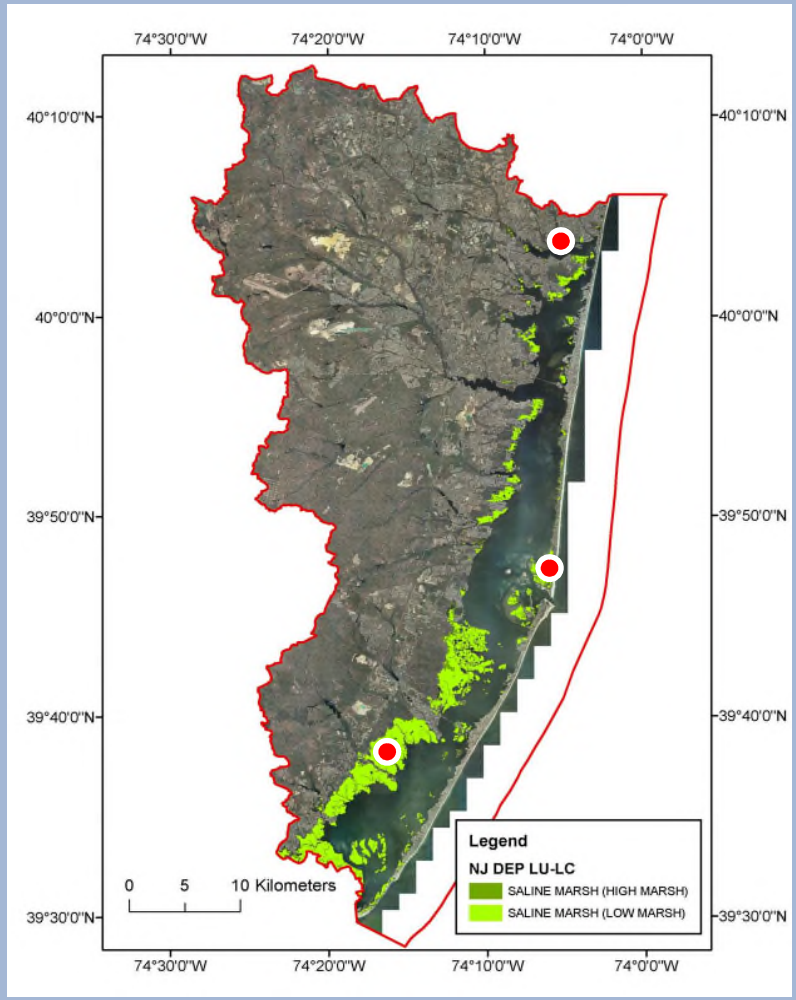
Mid-TRAM

- **Rapid Condition Assessment**

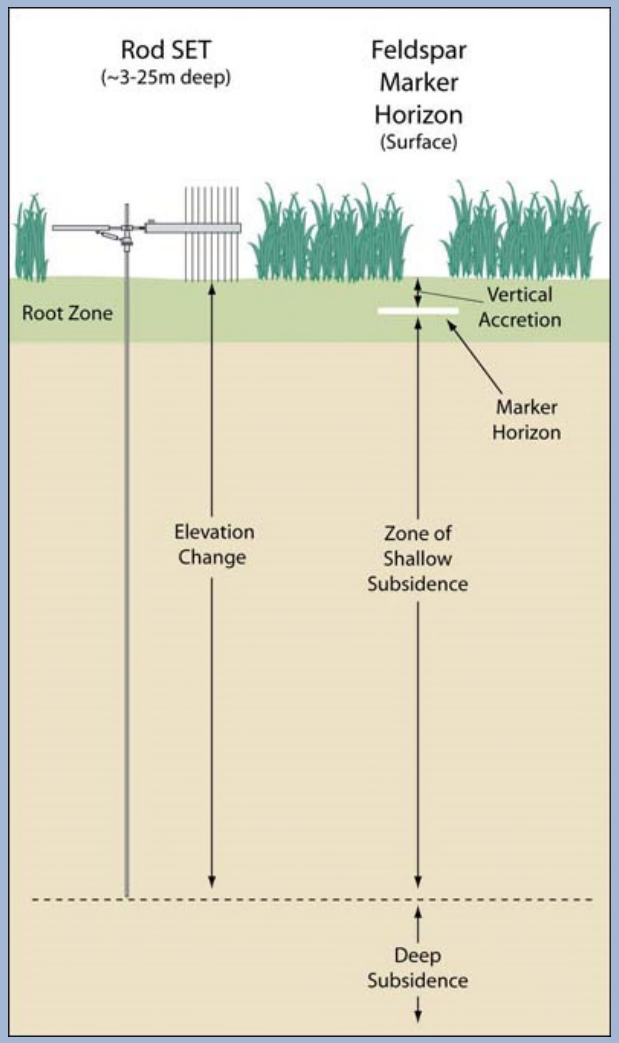
- ***Utilizes EPA Tiered Wetland Monitoring and Assessment***
- ***EPA HQ, R2 & R3 WPDG funded $$$$$***

Site Specific Intensive Monitoring





SETs and MHs



- Measures elevation change
- Paired with marker horizons to measure surface accretion

Elevation assessment

Relative elevation of SET benchmarks (RTK-GPS)

Elevation relative to a geodetic control point

BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

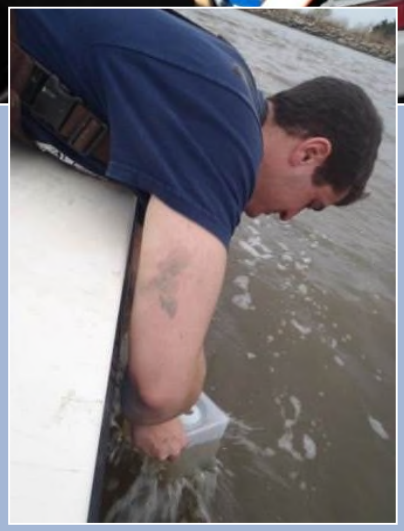
Plant community survey

BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

Faunal biomass

BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

Water-soil nutrients

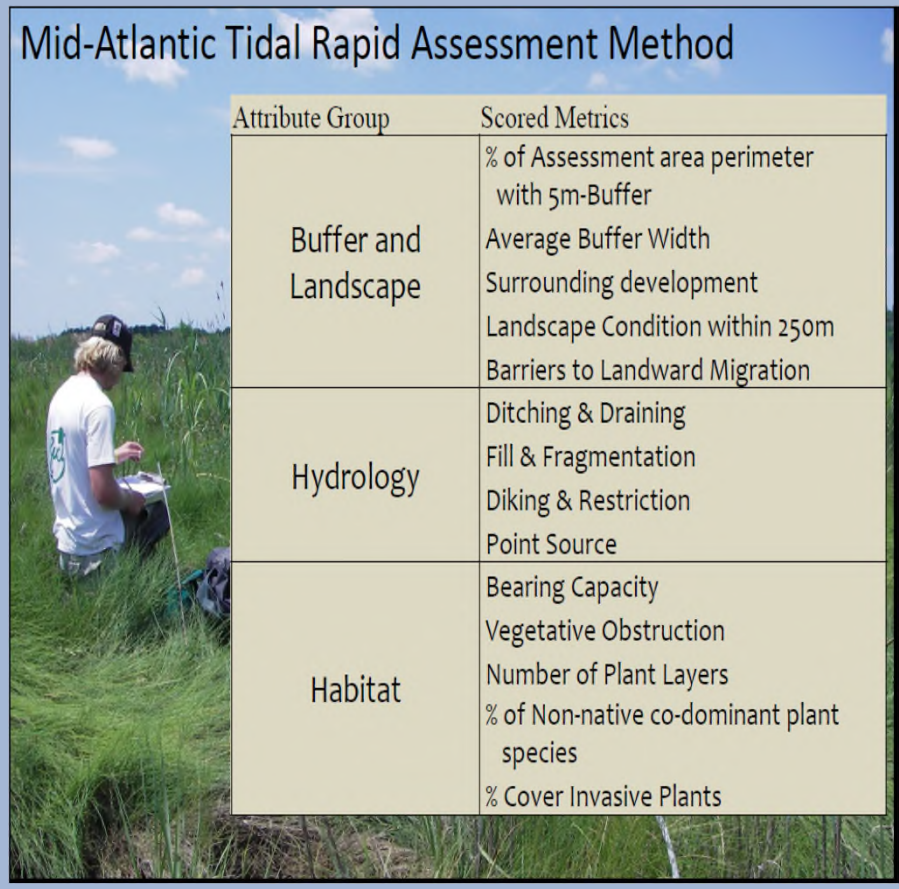


- Chl *a*

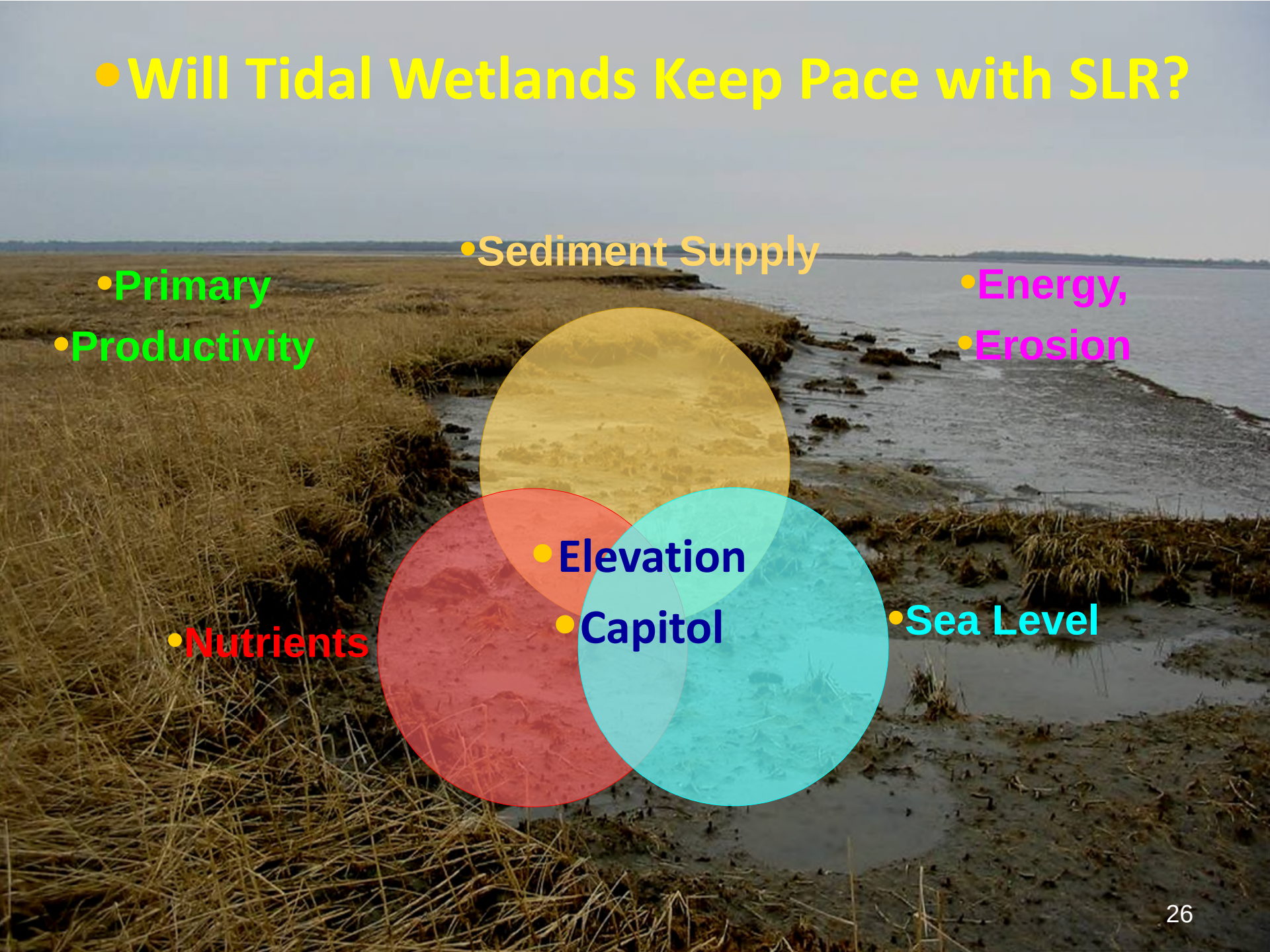
Mid-Atlantic Tidal Wetland Rapid Assessment

- Condition Assessment
- > 250 points to date assessed in Delaware and Barnegat Bays
- Tidal wetlands of the Delaware and Barnegat estuaries are predominantly stressed, although the types of stress and the nature of stressor-response relationships varies widely across the sample frame

- *Preliminary analyses contrasting RAM and SSIM per Watershed is providing encouraging relationships but analysis is just getting underway*



Will Tidal Wetlands Keep Pace with SLR?



Quo vadimus?

BARNEGAT BAY PARTNERSHIP
RESEARCH · EDUCATE · RESTORE

Expansion of wetland monitoring and assessment region-wide (DE and NJ)

Volunteer shoreline assessment program- EPA, NJDEP

Promote other "comprehensive monitoring" for a better understanding of bay stressors at different scales

Resource constraints-collaboration and funding continuity is essential, especially post-Sandy

Ecosystem modeling to identify estuary goals (e.g., wetlands, SAV, shellfish) for EBM